What is claimed is:

1. A shower head electrode for use in a plasma reaction chamber, said electrode comprising:

a central portion;

a plurality of gas outlets in the central portion of the electrode through which process gas can be delivered from an exposed surface of the electrode; and

a step projecting from the exposed surface of the electrode, the step being located at a peripheral portion of the electrode and extending at least partially around the central portion of the electrode, the step controlling a localized density of the plasma formed adjacent the exposed surface of the electrode.

2. The electrode as claimed in claim 1, wherein the central portion of the electrode is substantially planar.

3. The electrode as claimed in claim 2, wherein said step has an inner surface adjacent to the central portion of the electrode, a bottom surface substantially parallel to the substantially planar surface of the electrode and an outer surface opposite the inner surface.

4. The electrode as claimed in claim 1, wherein the step is located inwardly from the outer periphery of the electrode such that a portion of the electrode extends beyond the step.

5. The electrode as claimed in claim 3, wherein the inner surface of the step forms an obtuse angle with respect to the substantially planar central portion of the electrode.

6. The electrode as claimed in claim 5, wherein the inner surface forms an angle of 90 degrees or more with the substantially planar central portion of the electrode and the outer surface of the step forms an angle of 90 degrees or more with a plane parallel to the substantially planar central portion of the electrode.

7. The electrode as claimed in claim 1, wherein the step is an integral part of a one-piece monolithic stepped electrode.

8. The electrode as claimed in claim 1, wherein the step is formed as a separate piece and bonded to the exposed surface of the electrode.

9. The electrode as claimed in claim 1, wherein the step comprises a separate piece movably mounted in a groove in the electrode such that thickness of the step can be adjusted.

10. The electrode as claimed in claim 1, wherein the step extends completely around the central portion of the electrode.

11. The electrode as claimed in claim 1, wherein the electrode is made from a material selected from the group consisting of silicon, silicon carbide, graphite and aluminum.

12. A method of treating a semiconductor substrate in a plasma chamber, said method comprising the steps of:

supporting the semiconductor substrate on a bottom electrode;

supplying process gas to the chamber;

forming a plasma adjacent an exposed surface of an upper electrode; and

processing the semiconductor substrate with the plasma;

wherein the upper electrode has a central portion and a peripheral portion surrounding the central portion, the peripheral portion including a step projecting from an exposed surface thereof and extending at least partially around the central portion, the step providing a predetermined localized density of the plasma formed adjacent the exposed surface of the electrode.

13. The method as claimed in claim 12, wherein the upper electrode is a showerhead electrode comprising a plurality of gas outlets and the process gas is discharged into the chamber through the gas outlets.

14. The method as claimed in claim 12, wherein the step is located inwardly from the outer periphery of the electrode such that a portion of the electrode extends beyond the step.

15. The method as claimed in claim 12, wherein the semiconductor substrate comprises a semiconductor wafer and the processing step comprises etching the semiconductor wafer with the plasma.

16. The method as claimed in claim 12, wherein the upper electrode is grounded and the bottom electrode is powered during the processing step.

17. The method as claimed in claim 12, wherein the plasma chamber further comprises an edge ring mounted on the bottom electrode, the edge ring including a recessed portion underlying an outer periphery of the semiconductor substrate mounted on the bottom electrode, at least part of the edge ring facing the step and cooperating therewith to provide the predetermined localized density of the plasma.

18. The method as claimed in claim 12, wherein the step comprises a separate piece of material movably mounted in a groove in the upper electrode such that the thickness of the step can be adjusted, the method further comprising the step of moving the step to provide a desired step thickness.

19. A plasma chamber for use in manufacturing a semiconductor device, said plasma chamber including a top electrode and a bottom electrode having respective surfaces facing each other and spaced apart from one another to define a gap therebetween, the bottom electrode comprising a substrate support, and the top electrode having an exposed surface comprising a central portion and a step projecting from a peripheral portion thereof and extending at least partially around the central portion, the step controlling a localized density of the plasma formed adjacent the exposed surface of the top electrode.

20. The plasma chamber of claim 19, wherein the top electrode is a showerhead electrode comprising a plurality of gas outlets through which process gas can be delivered into the chamber.

21. The plasma chamber of claim 19, wherein the central portion of the top electrode is substantially planar.

22. The plasma chamber of claim 19, further comprising an edge ring mounted on the bottom electrode, the edge ring including a recessed portion underlying an outer periphery of a semiconductor substrate mounted on the lower electrode.

23. The plasma chamber of claim 21, wherein said step has an inner surface adjacent to the central portion of the top electrode, a bottom surface substantially

parallel to the substantially planar central portion of the top electrode and an outer surface opposite the inner surface.

24. The plasma chamber of claim 23, wherein both the inner surface of the step and the outer surface of the step form an angle of 90 degrees or more with respect to a plane parallel to the substantially planar central portion.

25. The plasma chamber of claim 19, wherein the step comprises a separate piece movably mounted in a groove in the top electrode such that the thickness of the step can be adjusted.

26. The plasma chamber of claim 19, wherein said step is formed as a separate piece and bonded to the exposed surface of the top electrode.

27. The plasma chamber of claim 22, wherein the plasma chamber is a semiconductor etching apparatus.

28. The plasma chamber of claim 22, wherein the top electrode is made from a material selected from the group consisting of silicon, silicon carbide, graphite and aluminum and the edge ring is made from a material selected from the group consisting of quartz, silicon, silicon carbide, graphite and aluminum.

29. The plasma chamber of claim 22, wherein the edge ring includes an inclined surface adjacent the recessed portion.

30. The plasma chamber of claim 29, wherein the inclined surface forms an angle of 5 to 60 degrees with respect to a plane perpendicular to a surface of the bottom electrode on which the substrate is supported.

31. The plasma chamber of claim 22, wherein the edge ring is made from a material selected from the group consisting of quartz, silicon, silicon carbide, graphite and aluminum.